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Patient Scenario for Digital Learning Game CareMe:

ST-elevation Myocardial Infarction

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The purpose of this thesis was to develop a ST-elevation myocardial infarction (STEMI) patient scenario by utilising a digital learning game, CareMe. The aim of the scenario was to improve nursing students' competence in the recognition of symptoms and treatment of acute myocardial infarction. CareMe has been developed by Helsinki Metropolia University of Applied Sciences' health and nursing unit and nowadays by a startup company Practigame. The different digital patient scenarios enable a new learning method for nursing students.

The CareMe learning game is situated in a healthcare environment, where the students are able to practice their clinical and decision-making skills in a safe environment. The patient scenario is situated in an emergency department where the STEMI patient arrives due to a sudden decline in their general condition. The nursing student must be able to identify the signs and symptoms of acute myocardial infarction, interpret ECG recordings and give correct treatment according to the symptoms. So far, the patient scenarios on CareMe have been in Finnish but this scenario has also added English content to the game.

The nature of this work is a practice-based thesis. It is divided into the digital part of the thesis which is the patient scenario, and the written part which is the report of the thesis. When planning the patient scenario, academic articles, medical guidelines and health literature have been used as a source so that the scenario would be as valid and plausible as possible.

In future theses, further patient scenarios with myocardial infarction patients at different phases of the treatment could be developed. A continuum of the scenario could increase the nursing students' understanding of the patient's care pathway and comprehensive care. Also the already developed patient scenario could be tested among nursing students to gain information about its playability.

Keywords	STEMI, acute myocardial infarction, digital learning game, patient scenario, CareMe, learning

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Tekijä(t) Otsikko Sivumäärä Aika	Anna Ranta Potilasskenaario digitaaliseen CareMe-oppimispeliin: ST-nousuinfarkti 22 sivua 30.3.2016
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Opinnäytetyön tarkoituksena oli kehittää ST-nousuinfarktin potilasskenaario digitaalista CareMe-oppimispeliä hyödyntäen. Potilasskenaarion tavoitteena oli parantaa sairaanhoitajaopiskelijoiden pätevyyttä akuutin sydäninfarktin hoidossa ja oireiden tunnistamisessa. CareMe-oppimispeliä on kehitetty Metropolia ammattikorkeakoulun Terveyden ja hoitamisen yksikössä ja nyttemmin start-up yritys Practigamen toimesta. Oppimispelin erilaiset digitaaliset potilasskenaariot tarjoavat hoitotyön opiskelijoille uuden oppimismenetelmän.

CareMe sijoittuu terveydenhuollon ympäristöön, jossa hoitotyön opiskelijat voivat turvallisessa ympäristössä harjoitella kliinisiä taitojaan ja päätöksentekotaitojaan. Potilasskenaario on kehitetty päivystysosastolle, jonne ST-nousuinfarktia sairastava potilas saapuu äkillisen yleistilan laskun vuoksi. Sairaanhoitajaopiskelijan täytyy kyetä tunnistamaan akuutin sydäninfarktin oireet, tulkita EKG-käyrää sekä antaa oikeaoppisesti oireenmukaista hoitoa. Tähän asti CareMe:n potilasskenaariot ovat olleet suomenkielisiä, mutta tämä skenaario on lisännyt peliin myös englanninkielistä sisältöä.

Opinnäytetyö on luonteeltaan toiminnallinen. Työ sisältää toiminnallisen osuuden eli potilasskenaarion ja opinnäytetyöraportin. Potilasskenaarion suunnittelussa on käytetty lähteenä akateemisia artikkeleita, hoitosuosituksia ja kirjallisuutta, jotta skenaario olisi mahdollisimman pätevä ja uskottava.

Tulevissa opinnäytetöissä voitaisiin kehittää lisää skenaarioita sydäninfarktipotilaan hoidon eri vaiheisiin. Skenaarion jatkumo voisi lisätä hoitotyön opiskelijoiden ymmärrystä potilaan hoitoketjusta sekä kokonaisvaltaisesta hoidosta. Sairaanhoitajaopiskelijat voisivat myös testata jo olemassa olevaa skenaariota, jotta saataisiin tietoa sen pelattavuudesta.

Avainsana	ST-nousuinfarkti, akuutti sydäninfarkti, digitaalinen oppimispeli, potilasskenaario, CareMe, oppiminen

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Contents

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1 Introduction

As technology improves, different methods for nursing education are emerging. To enhance the theoretical learning of today's students', the use of simulation, in its many forms, has quickly increased in nursing education. Simulations play an important role in the future of nursing education; games being one way to develop learning. (Nehring & Lashley 2009.) This thesis will introduce a new patient scenario to the CareMe digital learning game with the aim of improving nursing students' competence in treating a patient with acute myocardial infarction.

Cardiovascular diseases continue to be the largest single group of causes of death, even though the mortality rate from cardiovascular diseases has significantly fallen in Finland (THL, 2014). This thesis will focus on ST-elevation myocardial infarction (STEMI) which is the most common myocardial infarction (Riikola & Mäntylä 2011). Myocardial infarction (MI) occurs from acute myocardial ischemia that causes necrosis in the myocardium. The underlying cause for MI in most cases is a long-term coronary artery disease that constricts the coronary arteries which supply the oxygenation of the myocardium. (Kettunen 2014.)

If the oxygen flow cannot be returned within a few hours, a permanent damage will occur in the myocardial cells (Mäkijärvi, Kettunen, Kivelä, Parikka & Yli-Mäyry 2011: 265). Recognition of the symptoms and early diagnosis is essential in the case of acute MI because the sooner the correct treatment is started the better the prognosis (Käypä hoito 2014). This thesis will review, from a nursing point of view, the recognition of symptoms and treatment of acute MI.

The nature of this work is a practice-based thesis. It is divided into the digital part of the thesis, which is the patient scenario, and the written part which is the report of the thesis. Practice-based theses can have various end-products but their combining nature is that they always introduce a concrete product that has been planned using theoretical knowledge (Vilkka & Airaksinen, 2003). In this paper the key concepts of the thesis are introduced together with the implementation and report of the patient scenario.

2 Purpose and aim of the thesis

2.1 Purpose and aim

The purpose of this thesis was to develop a ST-elevation myocardial infarction patient scenario using a digital learning game. The thesis was implemented as a practice-based thesis, consisting of the patient scenario and a written report.

The aim of this thesis is to introduce a new patient scenario to the CareMe digital learning game with the aim of improving nursing students' competence in treating a patient with acute myocardial infarction.

2.2 Connection to working life

CareMe learning game is an ongoing project that is being developed with the aim of creating a modern learning environment for the future of health care education. Developing a simulation game requires multidisciplinary expertise. The patient cases have been planned together with nursing lecturers, clinical nursing specialists and a team of game designers and developers. (Metropolia University of Applied Sciences: 2014a.)

Previous theses on the CareMe learning game have been focused on nursing students' experiences about learning clinical and decision making skills through a virtual patient. The results showed that nursing students found the game to be an interesting and useful way to learn new skills and develop previous knowledge in a safe environment. This thesis will introduce a new patient case to the game. So far, the patient scenarios on CareMe have been in Finnish but this scenario will also add English content to the game.

The game has been tested with nursing students but also with nurses from Töölö Hospital's neurosurgical ICU (Metropolia University of Applied Sciences 2014a). At the moment the in-game tests have been focused on gauging nursing students' opinions but in the future the game could also offer additional training for registered nurses as well. The newest version of the game was released in March 2016 and the aim is to get it into commercial and international markets.

3 Schedule and implementation

I began my thesis in April 2015 with an information session about the thesis topic options and was pleased to hear that there was an opportunity to do a thesis related to the CareMe learning game as I had tried the game once before and thought it was a very innovative new learning method for nursing students.

In May my mentor and I agreed a meeting at Metropolia's office in Technopolis where the learning game is being developed. The subject for my thesis took shape after discussing with the game's founder and nursing lecturer Jaana-Maija Koivisto. I chose to develop a patient scenario about myocardial infarction based on my own interest in the nursing care of acutely ill patients.

After the summer I began actively working on my thesis and searching for theoretical knowledge about acute myocardial infarction, learning games and the use of simulation in healthcare education. When deepening my knowledge about myocardial infarction, I tried to take notice of things that I found particularly hard to internalise and think how they could be involved in the patient scenario. I also familiarised myself with the previous patient scenarios created for CareMe by playing them through and gaining ideas from them.

I formed an initial plan for my scenario and in October I had another meeting with the game's designer and developer where we discussed some ideas for the scenario and how they could be implemented. A few weeks after the meeting I sent the complete scenario plan to the game's developers who have experience about the technical implementation of the digital learning game.

In February 2016 the scenario plan was made into a real game format and I received positive feedback about the scenario. Its content has also been used as an aid to develop a chest pain scenario in Finnish. Lastly I did some final small changes to the scenario, finished the written report and returned the final thesis at the end of March 2016.

4 Key concepts

4.1 Myocardial infarction

4.1.1 Causes

The first key concept in my thesis is myocardial infarction (MI). MI occurs from acute myocardial ischemia that causes necrosis in the myocardium. In Finland 25 000 people come down with MI annually. It is a life threatening condition that causes 13 000 deaths per year. (Kettunen 2014.)

The underlying condition is almost always coronary artery disease. In coronary artery disease the coronary arteries are narrowed by a build up of atherosclerotic plaque. When the artery becomes suddenly stenotic or obstructed, myocardial infarction occurs. The obstruction is often caused by a rupture on the surface of the plaque in the inner layer of the coronary artery. The rupture causes a blood clot that suddenly obstructs the artery. (Kettunen 2014.)

4.1.2 Symptoms and diagnosis

A typical symptom of acute MI is a severe squeezing chest pain behind the sternum caused by the ischemia. The pain can be squeezing and heavy and radiate to the arms, jaw, upper abdomen or back. The pain often starts suddenly and gets worse when moving. (Käypä hoito 2014.) Sometimes there is only little or no pain in which case other symptoms cause the patient to seek help. Especially the elderly, diabetics and patients with dementia might not experience pain. Other common symptoms are nausea, weakness, sweating and dyspnea. (Kettunen 2014.)

Patient with a MI might have sweaty, pale and cyanotic skin. These signs are caused by circulatory failure. The patient can also experience shortness of breath, due to the chest pain or the development of cardiac failure. Nausea is a common symptom that can be caused by the overall situation or signal about the location of the infarction. The patient might develop arrhythmias that can be felt as an irregular pulse and seen on the ECG monitor. Due to circulatory failure, fear or severe pain, the patient may become confused. (Holmia, et al. 2004: 230-231.)

Depending on the location and size of the myocardial infarction, it can cause life-threatening arrhythmias or an acute heart failure and pulmonary edema. Ventricular fibrillation is the most dangerous arrhythmia and it is the most common reason for sudden death related to MI. (Kettunen 2014.) At the beginning, blood pressure might rise due to the pain but if the situation is prolonged it may drop and cause a cardiogenic shock (CS).

Cardiogenic shock is a critical state of inadequate perfusion to organs caused by the decreased cardiac output (Thiele, Ohman, Desch, Eitel & Waha 2015: 1).

> Established criteria for the diagnosis of CS are: (i) systolic blood pressure <90 mmHg for >30 min or vasopressors required to achieve a blood pressure ≥90 mmHg; (ii) pulmonary congestion or elevated left-ventricular filling pressures; (iii) signs of impaired organ perfusion with at least one of the following criteria: (a) altered mental status; (b) cold, clammy skin; (c) oliguria; (d) increased serum-lactate (Thiele et al. 2015: 1).

This thesis will focus on ST-elevation myocardial infarction (STEMI) which is the most common myocardial infarction (Riikola & Mäntylä 2011). When the infarction is developed into an artery with no collateral circulation, the myocardial area where the artery is normally providing oxygen to becomes ischemic so quickly that ST-segment elevations can be seen on the ECG (Mäkijärvi, Kettunen, Kivelä, Parikka & Yli-Mäyry 2011: 265). Apart from the ST-segment elevations, patients with STEMI do not have any specific clinical findings. Clinical examination is used to assess the haemodynamic status. (Käypä hoito 2011.)

In STEMI diagnosis ECG plays a key role and it should be obtained as soon as possible. Even at an early stage, the ECG recording is seldom normal. If the ECG is not diagnostic but the symptoms continue, repeated recordings should be obtained and, if possible, the current ECG should be compared with previous records. When suspecting a MI, an ECG with at least 14-leads should be registered (EKG-12 + V4R + V8). (Käypä hoito 2014; ESC guidelines 2008) Blood sampling for serum markers of necrosis is routinely done in the acute phase, but waiting for the results should not delay the initiation of reperfusion treatment (ESC guidelines 2008: 2914).

How the infarction is treated will have an effect on how large and severe damage the necrosis will cause to the myocardium ultimately. The early recognition and diagnosis is vital in myocardial infarction because the sooner the correct treatment is started the better the prognosis is. The diagnosis consists of the patient's symptoms, medical history, ECG recordings and blood sampling. (Käypä hoito 2014.)

4.1.3 Acute treatment

The risk of life-threatening arrhythmias is significant during the early stages of myocardial infarction, thus ECG monitoring and preparation for possible resuscitation should be initiated (McGloin & McLeod 2010: 29). The patient is put into a half-sitting or supine position to rest. As first aid, patients are routinely given acetylsalicylic acid (ASA) to prevent

further blood clot formation. The dose is 250-500 mg i.v. or per os, unless the patient has a known ASA allergy. If the systolic blood pressure is greater than 100 mmHg, fast acting nitroglycerin is given in two doses to reduce the cardiac workload and oxygen demand. For analgesia, morphine or oxycodone are given 2-4 mg i.v. every 5 minutes until the pain has eased. (Käypä hoito 2011.)

The evidence for routine administration of oxygen for all patients with acute MI is currently insufficient. There is evidence to suggest that routine administration of oxygen is not beneficial for treatment of MI and that it may in fact be harmful. However, in conditions like hypoxia, dyspnea or acute congestive heart failure, the administration of oxygen is crucial. Clinical assessment of the patient and non-invasive monitoring of blood oxygen saturation helps assess the need for oxygen. (Cabello, Burls, Emparanza, Bayliss & Quinn 2010: 4.) Target oxygen saturation with pulse oximeter is from 94% to 98% and in severe COPD from 88% to 92%. (Käypä hoito 2011.)

Fluid therapy is given according to the patient's symptoms to maintain fluid balance. Volume replacement therapy is only needed in right ventricular infarction, shock or if the patient has lost a lot of fluids due to vomiting or sweating. Beta blockers can be used if the patient is tachycardic or hypertensive and they do not have an acute congestive heart failure. In case of bradycardia, atropine is given (0.5–1 mg i.v., up to a total dose of 2 mg). (Käypä hoito 2011.)

Anxiety is a natural reaction to the pain and the circumstances around STEMI. Reassuring the patient and managing the pain with opioids is important to keep the patient relaxed. If needed, diazepam 2,5 mg i.v. can be given to ease the anxiety. Side effects from opioids include nausea and vomiting, hypotension with bradycardia, and respiratory depression. Antiemetics (e.g. ondansetron 4 mg i.v.) may be administered concurrently with opioids. (ESC guidelines 2008: 2914-2915; Käypä hoito 2011.)

In the acute phase of STEMI the most important aspects for a good short-term prognosis are taking care of the patient's vital signs, treating and preventing serious arrhythmias and early reperfusion treatment. The obstructed artery can be restored with either percutaneous coronary intervention (PCI) or intravenous thrombolytic therapy. (Tierala & Mäkijärvi 2015.)

PCI followed by effective antithrombotic drug therapy provides an adequate reperfusion in 90% of patients and is the preferred therapeutic option when it can be quickly performed by an experienced cardiology team. In acute STEMI a rapid PCI is more effective than thrombolytic therapy, at least if the obstruction has been present more than 2-3 hours. (Tierala & Mäkijärvi 2015.) Any delay in PCI after a patient arrives to hospital is associated with higher mortality in those admitted with STEMI thus the time to treatment should be as short as possible (Rathore, Curtis, Chen, Wang, Nallamothu & Krumholz 2009: 1).

Intravenous thrombolytic therapy can be started also in an out-of-hospital setting. If the time delay for PCI is long, thrombolytic therapy is a suitable option. Both treatment options are acceptable if the patient receives treatment in under three hours since the onset of the pain. (Tierala & Mäkijärvi 2015.)

4.2 Simulation in health care education

One of the challenges for today's nursing education is to offer students learning methods that enhance their clinical skills and enable safe and competent care for the patients (Peddle 2011). Most nursing students are considered to be kinesthetic learners that prefer active and engaging learning activities over lecture-based teaching (Boctor 2013). Learning clinical skills have traditionally been limited only to practice with real patients, carried out in hospitals, clinics and other health care settings. Nowadays, the use of alternatives, such as standardized patients, simulation and learning games has become widely utilised. (Kimhi et al. 2016.)

Virtual games and simulations that imitate reality allow students to practice clinical skills without risking the patient, which is why there are recommendations to increase the use of simulation and virtual pedagogy in nursing education (Sosiaali- ja terveysministeriö 2012: 18 & 22). Research has shown that simulation can improve student competence and satisfaction. Integrating theory and practice can help promote students' critical and reflective thinking skills that are needed to provide safe and competent patient care. (Boctor 2013; Kimhi et al. 2016.)

Kimhi et al. (2016) examined the role of simulation in promoting students' self-confidence/self-efficacy. The study aimed to discover whether simulation supports continuing development of the nursing process by investigating student outcomes when the simulation was placed either before or following clinical experience. The study's findings were

that simulation increased first-year students' self-confidence/self-efficacy although clinical experience had a greater effect.

Olderburg et al. (2013) found, however, that simulation improved first-year students' perception of their confidence and competence more than clinical experience. Kimhi et al. (2016) suggests that simulation may increase nursing students' confidence more in their technical skills, whereas clinical experience might increase their confidence in implementing the same skills with real patients in clinical settings. According to Kimhi et al. (2016) study simulation seems to be an efficient addition in improving students' self-confidence/self-efficacy together with clinical experience.

4.3 Web-based learning

The use of web-based distance education is growing as technology becomes more developed and the demand for health care workers is increasing. In web-based learning the students and teachers are not attached to time and space in the same way as in traditional teaching. By using the web as a learning platform, students can access the provided materials conveniently and interact with other students and teachers online. (Du et al. 2013: 167-168.)

The use of web-based learning methods offers nursing students more flexibility and a new role as an active, not passive learner. Other positive aspects cited in studies concerning the nursing students' perspective of distance education have been accessibility, interaction, convenience, teaching strategies and satisfaction. Learning hindrances have been identified as a feeling of isolation, lack of confidence, untimely feedback, downed computer links, and navigation issues. (Mancuso-Murphy 2016.)

Many nursing students have problems with understanding ECG and learning to interpret them through classroom lectures. Some studies have shown that nursing students who have been offered interactive web learning have had a significantly higher level of ability to interpret ECG recordings than the control groups. In most studies both knowledge of ECG and ability to interpret ECG recordings was increased by interactive web-based learning. (Jang, Hwang, Park, Kim & Kim 2004: 35-36.)

However, Jang et al. (2004) found that overall knowledge of ECG was significantly lower in students who used web-based instruction, than in those who used lecture-based instruction. Still, the ability to interpret ECG recordings was significantly higher in the group that used the web-based instruction. It seems that perhaps the visual simulation and

flexibility of web-based learning is effective. The study suggests that web-based teaching of ECG in combination with face-to-face lectures appears to be the most effective teaching strategy.

Technological expertise, interaction and relationships, convenience, well-timed feedback and flexibility are important aspects in distance education. For successful online learning, students need to be motivated, self-directed and active participants throughout the learning process. (Mancuso-Murphy 2016.)

4.4 Digital learning game

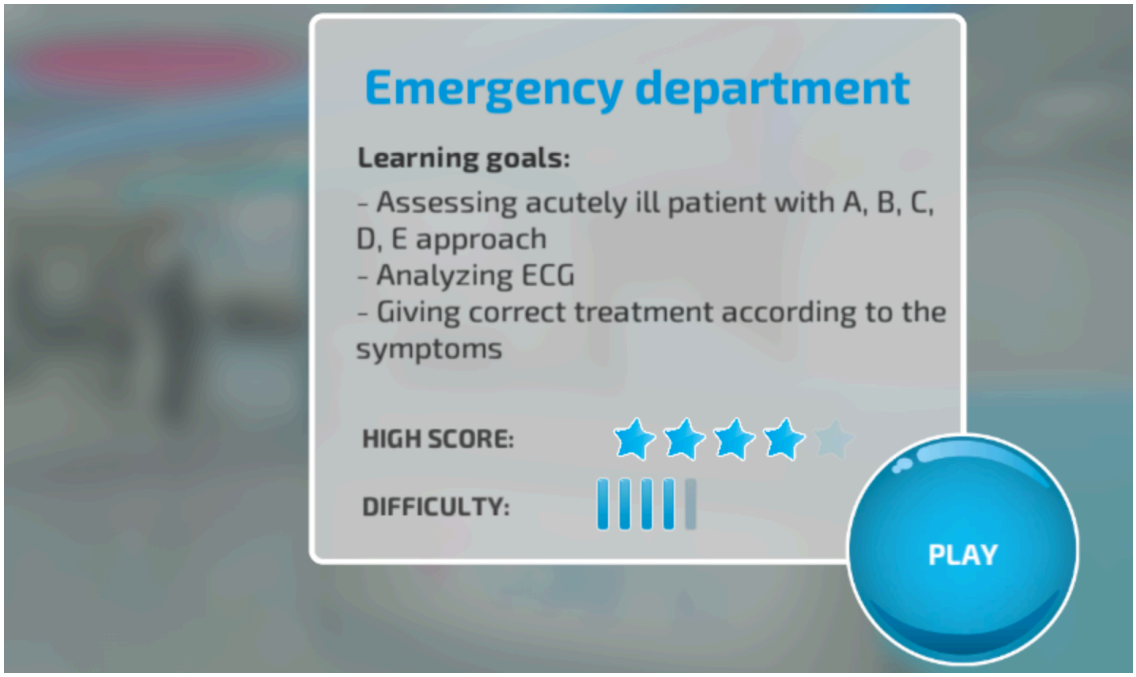
Using educational games is a good learning method to enhance collaboration among students and promote students' critical thinking skills and learning. Learning games offer a non-threatening environment, reducing the risk of failure and keeping the learning student-centered. The students have an opportunity for immediate feedback that helps clarify misconceptions through the discussion of correct answers and their rationales. (Glendon and Ulrich, 2005).

Digital learning games are used to refer to educational games in which the players have to solve the challenges of the game in a virtual learning environment by applying their know-how. Learning games have certain rules and restrictions under which players must act. (Peddle, 2011, p. 647.) The STEMI patient scenario presented in this thesis will add new content to a digital healthcare learning game - CareMe.

In CareMe, the user is able to solve realistic patient cases in a safe environment without having to be afraid of making errors and causing harm to a real patient. The idea of the game is to learn by doing - with the player actively participating in the treatment of a virtual patient. The game helps to further nursing students' theoretical knowledge and promote their professional growth. (Metropolia University of Applied Sciences 2014a.)
Each scenario consists of different phases where the player has to solve multiple-choice questions by interpreting the patient's anamnesis and symptoms. Each choice made during the scenario effects on the virtual patient's status in real time. The game gives the player feedback both during it and also afterwards. With the help of the on-screen feedback, the student can critically evaluate their own performance. (Metropolia University of Applied Sciences 2014a.)

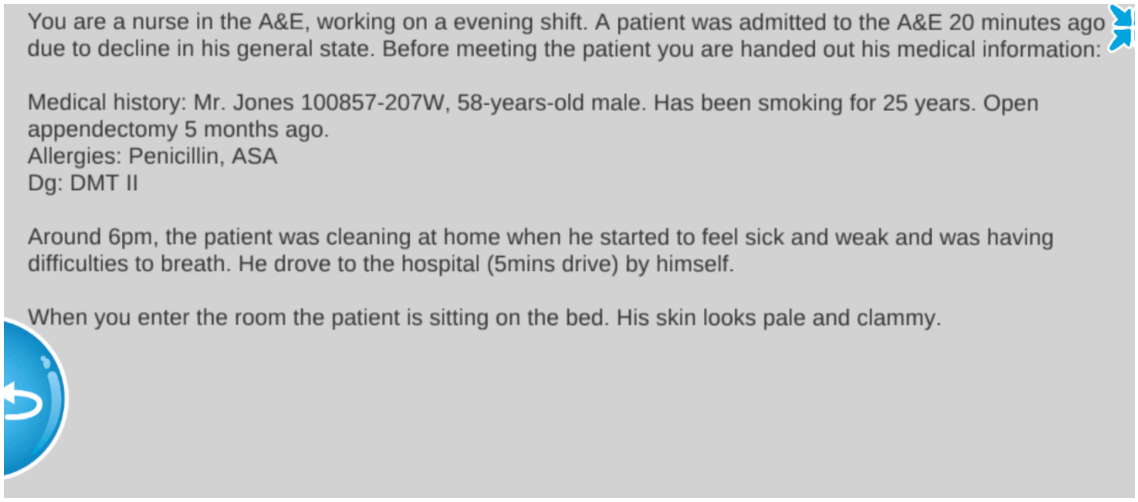
5 Patient scenario

In this patient scenario report I will describe the phases of the scenario and illustrate the gameplay by using screenshots taken of the scenario. The aim of the scenario is to improve nursing students' competence in treating a patient with an acute ST elevation myocardial infarction. To do so, the nursing student must be able to identify the signs and symptoms of myocardial infarction, interpret ECG recordings and give correct treatment according to the symptoms. The learning objectives are listed at the beginning of the scenario.



Picture 1. Learning objectives (Practigame Oy, 2016).

The scenario begins with the patient's anamnesis which contains only the most essential information about the patient. This includes the patient's age, underlying diseases, allergies and current status. Although the given information is quite limited and the patient's symptoms could be associated with several different conditions it contains a few small clues about possible myocardial infarction. The most typical symptom, chest pain, is not present but it is important to remember that, especially, diabetic and elderly patients might not experience chest pain during MI. Other common symptoms are nausea, weakness, sweating and shortness of breath (Kettunen 2014). Also the patient's history of smoking is relevant information when suspecting MI.



Picture 2. Patient anamnesis (Practigame Oy, 2016).

To gain more information about the patient, the scenario continues with the nurse's interview. Five questions appear on the screen and the nursing student is required to select the three most relevant questions.

Picture 3. Patient interview (Practigame Oy, 2016).

After the interview, the scenario will proceed to the assessment of the patient. To guide the assessment, the examination options are divided using the Airway - Breathing - Circulation - Disability - Exposure ´ABCDE` approach. The aim of the ABCDE approach is to serve as an immediate life-saving assessment and treatment tool by breaking down

complex clinical situations (Thim, Krarup, Grove, Rohde & Løfgren 2012: 117). According to Thim et al. (2012:118) training healthcare professionals for the recognition and management of critically ill patients increases their confidence and reduces concerns about the responsibility of the severely ill patient.

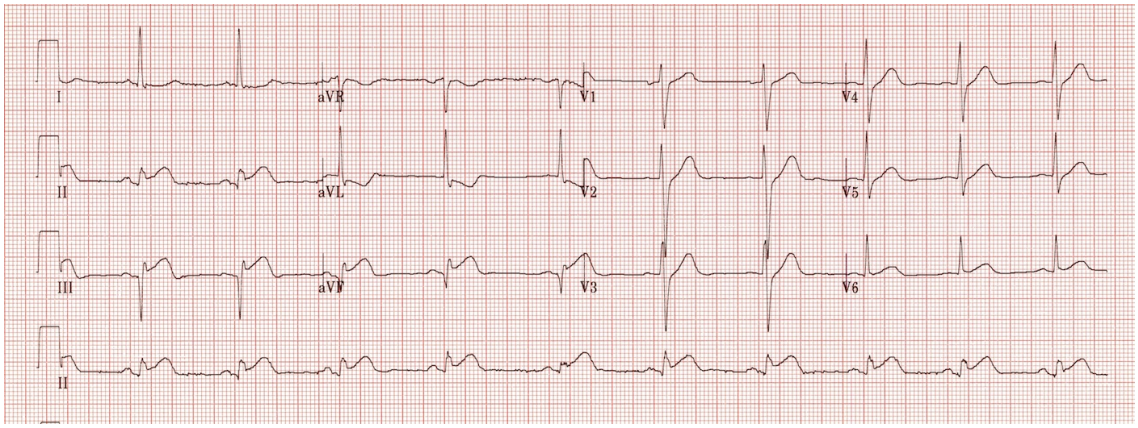
A digital patient scenario allows nursing students to see the outcome of their actions immediately. The game gives feedback and information throughout the scenario and the patient's condition improves and deteriorates based on the student's actions. The risk with a digital patient scenario is that instead of evaluating the options and having a good reasoning behind their choices, the student tries to randomly click on the options to resolve the scenario quickly (Cant, Young, Cooper & Porter 2015: 111). To avoid this in my scenario, the assessment options also include unnecessary tests and measurements that can lower the student's points in the scenario. These are: taking an arterial blood gas sample (ABG-analysis), measuring ventilation (EtCO2) and taking an x-ray. If the nursing student chooses a wrong or irrelevant examination, the game reasons why it is not needed at that moment and explains in what kind of situation the examination should be considered.

Picture 4. Assessment phase (Practigame Oy, 2016).

When suspecting a myocardial infarction, a correct ECG interpretation plays a crucial part of the diagnosis. In clinical settings nurses are often the first people to see the ECG recordings and even though it is primarily the doctor's responsibility to do diagnoses,

nurses are similarly responsible to interpret ECG and notice abnormalities (Jang et al. 2004:35).

During the assessment phase the nursing student will have to select whether to take a 12-lead or 14-lead ECG from the patient. When suspecting a myocardial infarction, a 14-lead ECG should always be registered (Käypä hoito 2014). If the student chooses the 12-lead ECG, the virtual patient will deteriorate and the scenario will end. When the student chooses to take a 14-lead ECG from the patient a picture of an ECG recording will appear on the screen. Instead of the game telling the result of the ECG, the student will have to interpret the picture and click on the leads that they can detect ST elevations in. There will be ST elevation in leads II, III and aVF.



Picture 5. ECG recording with ST elevation in leads II, III and aVF (Burns 2012).

Whilst the nursing student has to make considered actions, a rapid response and decision-making is essential for the patient's well-being, as in real life. During the examination of the patient, their condition will start to deteriorate and they will complain about heavy and squeezing pain on their chest. This will aid the nursing student to confirm their opinion about the patient's condition and also hasten them with decision-making about the treatment.

Picture 6. Patient starts to deteriorate (Practigame Oy, 2016).

In the treatment phase the patient monitor is shown on the screen and the patient's vital signs can be seen at one glance:

- BP 125/75
- p. 105
- RR 24
- SpO2 91%

Since the recent assessment, the patient's blood pressure, pulse and respiratory rate have increased whereas the oxygen saturation has decreased. This is an indication that the patient has hypoxemia and is experiencing pain and distress and is having difficulties to breathe. At this phase the nursing student has to choose a correct option for oxygen delivery, put the patient into a good position, choose correct medications and the amount of fluid, order suitable blood tests and consult the doctor.

The game will test the student's precision with options that might seem correct at first but are actually incorrect in this patient's case. As an example, when the student has to choose different medications for the patient, Acetylsalicylic acid and Atropin, which are both commonly used in the acute treatment of myocardial infarction (Käypä hoito 2014), are listed as options. However, in the patient's medical information that is shown at the beginning of the scenario, and which the nursing student can also go back to during the

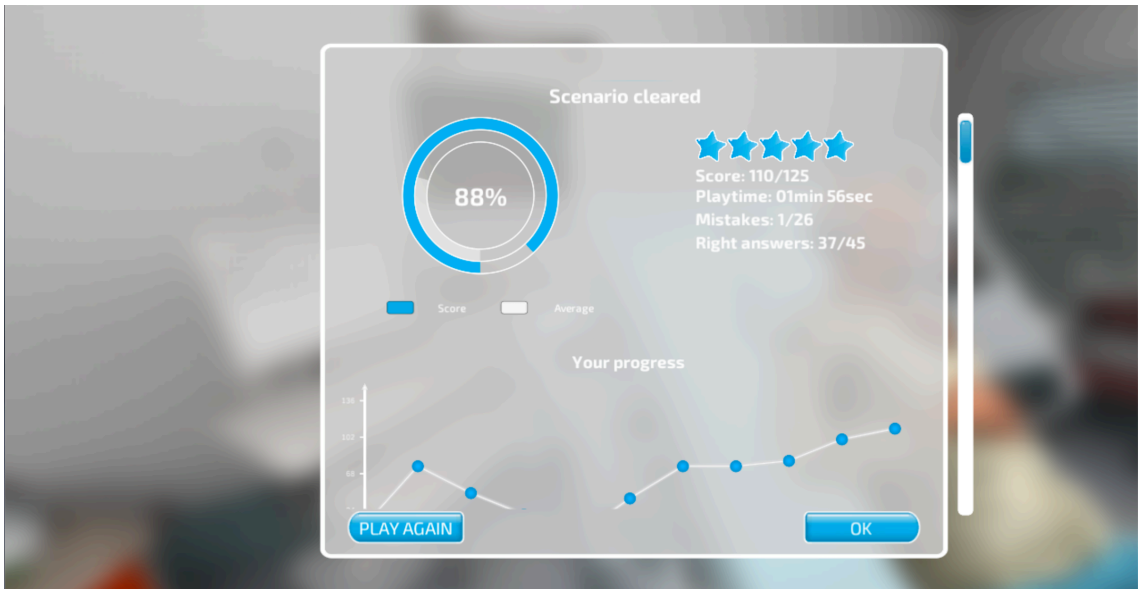
scenario, it is stated that the patient has Acetylsalicylic acid allergy. Atropin in turn, is used to treat bradycardia during myocardial infarction but the nursing student should see in the patient monitor that the patient is actually tachycardic and giving Atropin would only worsen the tachycardia.

Picture 7. Treatment phase (Practigame Oy, 2016).

At the end of the scenario the nursing student will have to consult the doctor and give their opinion about the patient's condition. Myocardial infarction can sometimes be very difficult to distinguish from other conditions with similar symptoms. Similar to MI, during pericarditis the patient is often experiencing chest pain and ST elevations can occur in the ECG. However, during pericarditis the chest pain is often experienced as sharp pain that may ease when leaning forward and worsen when laying down. During MI patients often experience heavy and squeezing pain that does not normally ease by changing position or breathing. In pericarditis ST changes are often seen in several leads whereas in MI they are in anatomically adjacent leads. (Phalen, T. 2001:134-135.) Also patients with pericarditis often have general symptoms of infection (Lommi & Lehtonen 2013). The purpose of this consultation phase is not only to test whether the nursing student got the diagnosis right but to provide them information about other conditions with similar symptoms to myocardial infarction and how to differentiate them from each other.

Picture 8. Consulting the doctor (Practigame Oy, 2016).

The scenario ends to the doctor's final diagnosis and request to send the patient for a PCI. After that the game gives a feedback summary to the player with the total score and a list of mistakes and right answers. The player is also able to follow their progress through an illustration of their previous scores.



Picture 9. Feedback from the scenario (Practigame Oy, 2016).

6 Discussion

The purpose of this thesis was to develop a ST elevation myocardial infarction patient scenario that can be utilized in the developing of the CareMe learning game. The scenario was developed with the aim of improving nursing students' competence in treating a patient with acute myocardial infarction. To do so, the nursing student must be able to identify the signs and symptoms of myocardial infarction, interpret ECG recordings and give correct treatment according to the symptoms.

6.1 Ethical consideration

The topic for my thesis was selected based on nursing students learning needs. The developed patient case is fictional, including the patient history and symptoms that I have created based on the most common risk factors and symptoms of myocardial infarction.

To help improve nursing students' ability to interpret electrocardiograms (ECG), which plays a very crucial part in recognising myocardial infarction, I wanted to include an ECG analysis to the scenario. I found a medical blog called LITFL, that had a lot of clear ECG recordings available for learning use. I contacted the physician behind the blog who gave me permission to use a picture of an ECG recording from their website in my scenario.

When asking for permission it is important to keep in mind that the goal for CareMe is to become a commercial learning game. When asking for permission to use the ECG picture I specifically mentioned that it is possible that the scenario might be part of a commercial learning game in the future. I also have to consider my own work input in the scenario. I am pleased to be part of creating something that might be useful for nursing students in the future and will give my permission to use the scenario for commercial use as well.

6.2 Reliability

During the data collection, I gathered information from various sources, such as academic articles, medical guidelines and health literature. I evaluated the sources critically, using as up to date and reliable information as possible. The search for relevant literature was done through CINAHL, PubMed, Ovid Medline and Terveysportti databases. The primary keywords used in the searches are combinations of the terms "digital learning

game", "nursing", "assessment", "acute myocardial infarction", "STEMI" and "learning". Through Theseus database I familiarised myself with other theses related to CareMe and also utilised their reference lists for information retrieval.

When developing the scenario for learning use I had the advantage of having a personal experience of what things other students could find challenging to learn. To ensure the veracity of the scenario, I also had to question my own expertise about myocardial infarction and make sure that all the information is based on evidence-based practice.

6.3 Further research

My patient scenario was focused on the acute treatment of myocardial infarction. However, MI patients' treatment does not end at the emergency department - from the cardiac catheterisation laboratory the patient is moved to a CCU and later into an inpatient ward. Further patient scenarios with myocardial infarction patient in different phases of the treatment could be developed in the future. A continuum of the scenario could aid the nursing students' understanding of the patient's care pathway and comprehensive care. Also the already developed patient scenario could be tested among nursing students to gain information about its playability.

6.4 Own reflection

Working on this thesis has been an interesting learning experience for me. Not only did I get to deepen my knowledge about myocardial infarction and its acute treatment but also learn about learning games and what it is like to be creating patient scenarios for them. During this process I also learned about information research, time management and multidisciplinary co-operation.

Doing the thesis alone gave me the freedom to work around my own schedules. I was also given a lot of independence to work on the patient scenario and its implementation which I found rewarding. This way of working worked quite well for me although sometimes I found it difficult to get things started without the support of another student.

Planning the patient scenario was surprisingly time-consuming and challenging, yet rewarding. Every action in the game, as in real life, will have a different consequence, and

I had to take into consideration all of them. Also, the game format gave the scenario its own restrictions. The gameplay is built up in a certain order which I had to follow in order to develop a functioning scenario.

I tried to create the scenario with other nursing students in mind, so that it would be challenging enough but at the same time not too difficult to solve. As the symptoms of myocardial infarction can vary a lot depending on the patient and the size and location of the infarction, I thought a lot about how the symptoms should occur in this patient scenario.

I decided to limit the subject and focus on ST-elevation myocardial infarction (STEMI) which is the most common myocardial infarction (Riikola & Mäntylä 2011). Chest pain is a symptom that is often incorporated with myocardial infarction but I decided not to have it as the patient's symptom right at the beginning. I thought that it is important that the student is able to recognise also other symptoms of myocardial infarction and resolve the condition not only based on the symptoms but also the clinical findings.

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